fluctuation in physico-chemical properties due to susceptibility of shallow waters to effects of surface runoff and meteorological conditions along the Lake Michigan shore. The harsh environment of the flooded beach zone is very unstable and unsupportive of extensive or fully developed complex aquatic communities that could develop in less turbulent off-shore waters.

- The sessile (benthos, attached periphyton) communities associated with substrates in the 2) flooded beach zone were sparse. Excessive turbulence at the sediment surface effectively limited the establishment and development of a resident benthic community. The limiting effect of the physical disruption was more apparent within the effluent dispersion zone but low richness and diversity values were exhibited at all study stations. Although members of the Oligochaeta, Amphipoda, Diptera and Mollusca were represented, no benthic invertebrates were observed in some replicates from \$120 and \$340, and only a total of 7 different benthic invertebrate taxa were identified from all samples. The benthic periphyton community was effectively absent because of a lack of a stable substrate. Analysis of the natural algal periphyton collected from the shifting sand substrates (epipsammon) indicated that benthic algae were present but sparse and likely not to be established on the sandy substrates. However, tangles of loose fragmented algae characteristic of splash zone and shore periphyton were present in some epipsammon samples. Upon evaluation, these tangles were not attached to sand grains, but appeared to be deposited as flotsam on the shifting substrates most likely following wave action at the shoreline.
- Aquatic communities associated with the water column (the plankton) exhibited a higher degree of community development than benthic communities. The greater development observed in the phytoplankton community again indicates the key role physical disruption and turbulence plays in limiting the benthic community. The phytoplankton represented members of all the major algal groups and typically exhibited the highest richness and diversity of all aquatic communities. A total of 60 different diatom taxa and 13 different non-diatom algal taxa were observed from the phytoplankton collections.

### 4.0 CONCLUSIONS

Analyses of the biological samples included taxonomic identification and enumeration of the benthos, phytoplankton, zooplankton and periphyton communities sampled at each sample site. Algal bioassays were conducted using cultured Selenastrum capricornutum and Scenedesmus quadricauda to replicate phytoplanktonic organisms exposed to different dilutions of effluent discharge characteristic of the effluent dispersion zone. Descriptive community structure metrics for each community type were used to assess potential differences between biological communities collected from sites located inside the effluent dispersion zone and biological communities collected outside the limits of the dispersion zone. Analysis of Variance (ANOVA) statistical procedures were used to detect significant differences in community structure at the 95 percent confidence level.

Analysis of the biological samples and statistical results showed few differences were present between biological communities within the effluent dispersion zone and biological communities located outside of the dispersion zone. Important findings are presented below.

1) Visual observations, including the use of SCUBA diving during sample collection indicated extensive disruption and unstable physico-chemical ecological conditions. These are a result of the natural physical setting of the extreme southern end of Lake Michigan. Low richness and diversity values observed in the biological collections from an intermittent and disruptive habitat would therefore be expected. Sample sites were selected that represented an area within the effluent dispersion zone (sites S120 and S340) and sites representing the local Lake Michigan water outside the effluent dispersion zone (sites S650, S1000, S2000 and S3500). Amoco Cove sites that represented ambient Lake Michigan conditions outside the dispersion zone were based upon previous dispersion modelling results for Outfall 001 and Outfall 002, on-site dye study interpretations, and in situ temperature and conductivity measurements at the time of site selection. The geographical area covered by the sample sites is best described as a flooded beach zone (USFWS 1970). The Flooded Beach zone is characterized by a nearly constant

# **ATTACHMENT 5**

# AMOCO FIELD BIOASSESSMENT DATA SUMMARY

Prepared for

AMOCO OIL COMPANY
WHITING REFINERY

Prepared by

ADVANCEDAQUATICTECHNOLOGY ASSOCIATES, INC. FORT COLLINS, COLORADO

**AUGUST 1994** 

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### 1.0 INTRODUCTION

### 1.1 Study Objective

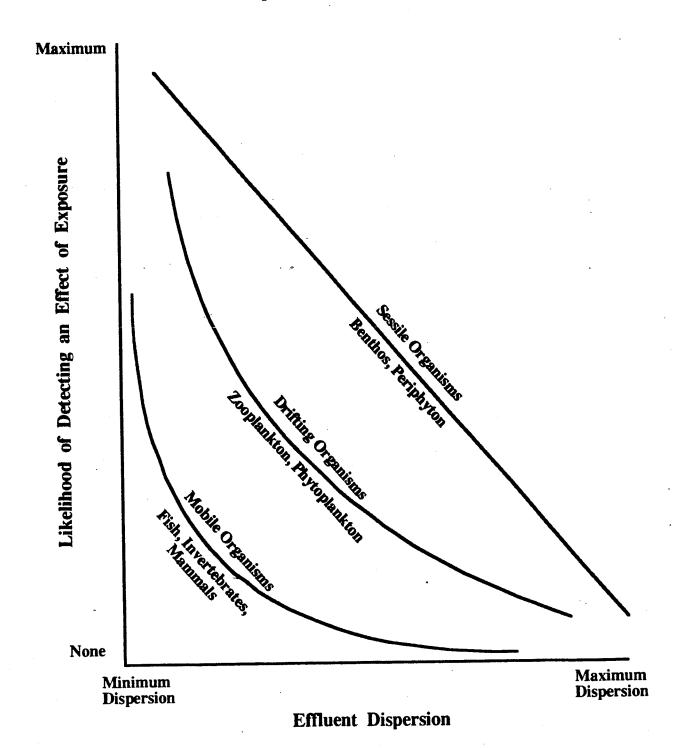
The Amoco field bioassessment study was designed to determine if there are differences in community structure or function of aquatic communities between receiving water areas inside and outside the existing effluent dispersion zone. The biological data were collected to answer the question, "Considering the normal aquatic communities in Lake Michigan, are there any significant site-specific differences in these communities associated with Amoco's discharge?" The dynamic nature of Lake Michigan in the near-shore environment (physically, chemically, and biologically dependent) makes this question a challenge to answer.

To most directly evaluate the aquatic communities, field sampling stations were divided into two categories, "inside the effluent dispersion zone" and "outside the effluent dispersion zone." These categories were determined from an independent previous study of the Amoco Outfall 001 that mapped the dispersion zone using a dye, computer modeling efforts, and field observations. If ecological parameters were not different between areas known to be within the effluent dispersion zone and areas known to be beyond the zone of dispersion, then the logical inference is that Amoco's effluent is not adversely impacting the lake ecology in the area where dispersion takes place. The Amoco discharge enters a shallow cove at the southern end of Lake Michigan, and the study stations are located within areas defined as the jet entrainment zone or zone-of-initial dilution (ZID) and the far-field mixing zone or total mixing zone. The reference or background area is located outside the edge of the far-field mixing zone.

### 1.2 Study Design

The approach chosen was to evaluate a series of stations beginning near Amoco's Outfall 001 and proceeding away from the outfall. The samples collected would represent the existing ecological communities along this progression at six specific sample sites. The sample locations were chosen to reflect points inside and points outside the area of effluent dispersion. Gross

FIGURE 1-1
Conceptual Community Sensitivity

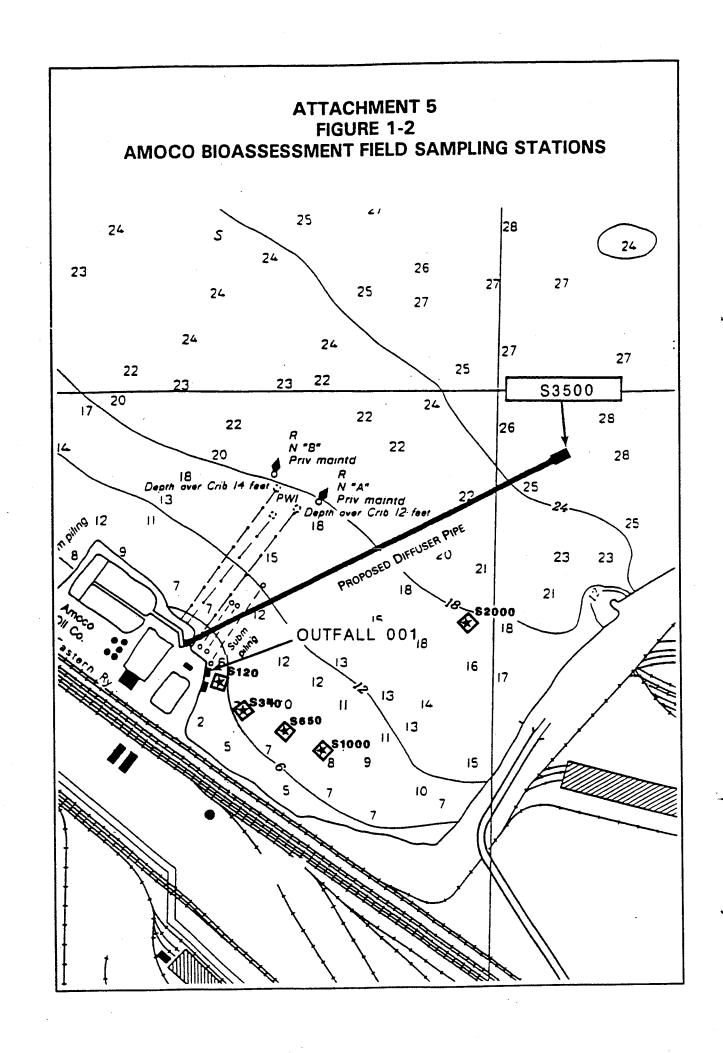


Figure, sessile organisms exhibit the highest potential for detecting an effect of exposure, followed by drifting and mobile organisms.

Consistent with the study design which compares biological collections from inside and outside the effluent dispersion zone, two sites were selected to assess possible differences in periphytic (attached) filamentous algae along the shore. Samples of filamentous algae were collected from shore rocks adjacent to Outfall 001 to represent the "inside dispersion zone" sample locations, and filamentous algae were collected from shore rocks near the Whihala Beach and Whiting City Park shooting range to represent "outside the dispersion zone" sites. Dispersion and trajectory studies have indicated that the filamentous shore algae has limited exposure to Amoco's effluent because of local current and prevailing wind patterns. However, the study was conducted to investigate possible influential effects from the effluent discharge on this specific biological community.

An evaluation of the plankton community included determination of chlorophyll-a from the study locations. Chlorophyll-a concentrations helped confirm trophic conditions for the southern Lake Michigan region associated with this study, and were used to evaluate potential differences between the sites located inside to effluent dispersion zone to sites outside the dispersion zone.

Functional tests can be used to evaluate the effects of the discharge waters on the overall ecological health of the plankton community. Typical tests include the standard light/dark bottle technique to determine primary production and respiration rates of the plankton over a designated time period as measured by dissolved oxygen or carbon tracer (C<sup>14</sup> isotope). Field evaluation (seechi depth), initial microscopical evaluation of plankton samples, and laboratory determination of chlorophyll-a indicated phytoplankton biomass may be too sparse for meaningful results. Therefore, functional tests to evaluate the effect of the Amoco 001 discharge waters on the overall health and productivity of phytoplankton utilized laboratory algal bioassay procedures. Lake Michigan water collected from the study sites within the zone of effluent dispersion, and a site well outside the zone of effluent dispersion were inoculated with known



at site S650. Standard field techniques were used to sample the different segments of the aquatic community, including plants floating in the water (phytoplankton), plants attached to artificial surfaces and rocks (periphyton), small animals floating in the water (zooplankton), and small organisms living on the bottom (benthos).

The nature of the Amoco Cove is characteristic of a flooded beach zone (USFWS 1970) which has extremely turbulent, unstable and highly fluctuating physical conditions. The present biological assessment serves as representation of a very dynamic environment with highly variable characteristics. To maximize understanding of a highly variable biological and physical system, a sampling approach of more samples at fewer stations was adopted. In such environmental variability there is a normal biological and sampling variability.

In evaluating aquatic communities, ecologists often use indices of species diversity, evenness and richness, as well as number of organisms per volume (density). These indices permit comparison of large tables of data and overall evaluation of the ecosystem. For example, diversity indices measure the distribution of different species found in a sample. Healthy communities typically have a relatively high diversity—many species of organisms filling several different niches. Stressed communities often have a lower diversity because the most sensitive species cannot tolerate the stress and the more tolerant species have taken over their niches. Commonly used community structure parameters such as taxonomic richness, measures of diversity, organism density, and taxonomic similarity were the focus for biological comparisons.

Hill's N1			
Mixzone	Lake		
5.44	4.21		
7.2	5.21		
5.53			
8.12	4.53		:
0.12	7.55		
	-	HILL'S N1	
			Lake
Mean		6.5725	4.6775
Standard Er	ror	0.655609	
Median		6.365	4.645
Mode	<b></b>	#N/A	#N/A
Standard Do	l	1.311218	
Variance	- Viation	1.719292	
Kurtosis		-3.67128	
Skewness		0.404394	
Range		2.68	1
Minimum		5.44	4.21
Maximum	<del> </del>	8.12	
Sum		26.29	
Count		4	
Codin	1	<del>                                     </del>	
<del></del>	<del> </del>		
		<del> </del>	
			<b></b>
		<del>                                     </del>	
	<u> </u>	<del> </del>	<b> </b>
<b> </b>	<del> </del>		
	<del>                                     </del>	<u> </u>	†
		<b> </b>	<del>                                     </del>
	<del> </del>		1
	<del> </del>	<del> </del>	
	<del> </del>	<del>                                     </del>	
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<del></del>	<b>†</b>		<del> </del>
	<b>†</b>		
	<del>                                     </del>	<del>                                     </del>	<u> </u>
<u></u>		1	<del></del>

# **A**NOVA

		Amoc	o Cove Be	nthos	
Simpson's	Diversity	*		· · · · · · · · · · · · · · · · · · ·	 
Mizzone	Lake				
0	0.513				
1	0.675				
0	0.928				
1	0.721				
1	0.766				
•	0.729				
	0.846				
	0.744				
l	0.909				
	0.864				
	0.815				
	0.364				
	0.6				
	0.666				
	0.1				
	0.439				
Benthos - Sim	pson's Diversi	ty		<del></del>	
Anova: Single-	Factor				
Summary					
Groups	Count	Sum	Average	Variance	
Mixzone	5	3	0.6	0.3	

A	1	Α.	,	

Lake

### Source of Variation

16

10.679

	22	ďſ	MS	F	P-value	F crit
Between Grou Within Group		.1 19	0.017325015 Q.10186726	0.170074417	0.684661693	4.380751761
Total	1.952802952	20				

0.6674375 0.049031862

# Amoco Cove Benthos

Richness						
Mizzone	Lake		•	•		l
2	3					1
1	2					
2	2					I
1	3					
1	2					ł
	2					i
	2					
	3					1
	2					
	2					1
	2					
	5					
	2					
	2					
	4					·
	4					
Benthos - Richness (Lo	g10 Transform	ation)				
Mizzone	Lake					
0.301029996	0.477121255					
0	0.301029996					
0.301029996	0.301029996					
0	0.477121255					
0 .	0.301029996			•		
	0.301029996					
	0.301029996					'
	0.477121255					
	0.301029 <del>99</del> 6					
	0.301029996					
	0.301029996					
	0.698970004					
	0.301029996					
	0.301029996	-				
	0.602059991					
	0.602059991	•				
Benthos - Richness Anova: Single-Factor	٠					
Summary						
Groups	Count	3	Average	Variance	ı	
Mixzone	5	0.60205999	0.120411998	-0.027185717		
Mikzone Lake	16	6.34475371	0.396547107			
-	40					
ANOVA						
Source of Variation						
	<i>\$</i> \$	ď	MS	F	P-value	F crit
Between Groups	0.290478469	1	0.290478469	13.95876482	0.001399522	4.380751761
Within Groups	0.395385335	19	0.020809754	•		
Total	0.685863805	20				

# Amoco Cove Benthos

Even	ness					
Mixzone	Lake	-				
1	0.858					
1	0.776			•		
1	0.461					
. <del>-</del>	0.569					
1 1	0.565					
1	0.692					
	0.583					
	0.549					
	0.492					
•	0.532					
	0.582					
	0.814					
	1.02					
	0.878					
	3.22					
	0.762					
Benthos - Evenn	and Contact	(o				
sentnos - r.venn Mixzone	less (Logiu i ra Lake	iniorination)				
•						
0	-0.066512712					
0	-0.110138279					
0	-0.336299075					
0	-0.244887734			**		
0	-0.177178355					
	-0.159893906					
	-0.234331445					
	-0.260427656					
	-0.308034897					
	-0.274088368					
	-0.235077015					
	-0.089375595		•			•
	0.008600172	_				
	-0.056505484	·				
	0.507855872		•			
	-0.118045029					
	~.110043023					
Benthos - Evenn	ess					
Anova: Single-F	actor					
Summary						
Groups	Count	Sum	Average	Variance		
J. Vaps				web	•	
Mixzone	5	0	0	0		
Lake	16		-0.134646219	0.039174532		
•	÷ :					
ANOVA						
n	·					
Source of Variati	22.	dſ	MS	F	P-value	F crit
D						
Between Groups		1	*	2.233148179	0.151501447	4.38075176
Within Groups	0.587617982	19	0.030927262			•
		••				
Total	0.656683141	20				

		Amoco	Cove Bent	thos		
Shannon Weine	r Diversity					
Mixzone	Lake					
0.693	0.743					
0	0.482					
0.693	0.154					
0	0.518					
0.	1.376					
	0.429					
	0.271					
	0.485	•				
	0.184					
	0.257					
	0.327					
	1.143					
	0.5					
	0.45					
	1.332					•
	0.983					
Benthos - Shan Anova: Single-l Summary	non Weiner Diversation	ersity				
Groups	Count	Sum	Average	Variance		
Mixzone	5	1.386	0.2772	0.1440747		
*****						
I aka	-	9.634	0.602125	0.157861317		
Lake	16			0.157861317		
Lake ANOVA	-			0.157861317		
	16	9.634	0.602125			
ANOVA	16 ation SS	9.634 df	0.602125 MS	F	P-value	F crit
ANOVA	16	9.634	0.602125		<i>P-value</i> 0.123655869	F crit 4.380751761

3.34641381

Total

# Amoco Cove Benthos

77701 - 370						
Hill's Ni						
Mizzone	Lake					
2	2.1					
1	1.62					
2	1.16					
1	1.67					
1	1.45			2°		
	1.53			÷		
	1.31					
	1.62					
	1.2					
	1.29					
	1.38					
	3.13					
·	1.64					-
	1.56					
	3.78					
	2.67					
					,	
Benthos - Hill's N1						
Mizzone	Lake					•
0.301029996	0.322219295					
0	0.209515015					
0.301029996	0.064457989					
0	0.222716471					
o	0.161368002					••
İ	0.184691431					
	0.117271296					
	0.209515015					
l	0.079181246					
	0.11058971					
	0.139879086					
	0.495544338					
	0.214843848					
		•				
	0.193124598	•				
	0.5774918					
	0.426511261					
Benthos - Hill's N1						
Anova: Single-Factor						
Min. paritio-1 mem.						
Summery						
Groups	Count	Sum	Average	Variance	•	
-	_	0 (00010001	0.100/11000	0.007107717		
Mixzone	5	0.602059991		0.027185717		
Lake	16	3.728920401	0.233057525	0.022181313		٠.
ANOVA						
Source of Variation						
Source of Variation	SS	ď	MS	F	P-value	F crit
Patrices Constant	0.048339104	1	0.048339104	2.08045492	0.165478422	4.380751761
Between Groups		1 19	0.048339104	2.00043472	U. 1UJ7110744	7.50151101
Within Groups	0.441462567	17	U.U43434872			
Total	0.48980167	20				
Total	V.₩070V10/	20				

# Amoco Cove Benthos

Hill's N1						
Mizzone	Lake					
2	2.1					
1	1.62					
2	1.16					
1	1.67					
1	1.45					
	1.53					
	1.31					
	1.62					
	1.2					
	1.29					
	1.38					
	3.13					
	1.64					
	1.56					
	3.78					
	2.67					
	2.07					
Benthos - Hill's N1	Y a1					
Mizzone	Lake					
0.301029996	0.322219295					
0	0.209515015					
0.301029996	0.064457989					
0	0.222716471					
0	0.161368002		-			
	0.184691431					
	0.117271296					
	0.209515015					
	0.079181246					
	0.11058971					
	0.139879086					
	0.495544338	•				
	0.214843848	•				
	0.193124598	•				
	0.5774918					•
	0.426511261					
Benthos - Hill's N1						
Anova: Single-Factor						
Summary						
_	Court	Sum	Average	Variance		
Groups	Count	Sum	WALLARE			
3. <i>C</i>	5	0.602050001	0.120411998	0.027185717		
Mixzone	16		0.233057525			
Lake	10	J.12072V4V1	4.2.5VJ ( 32.5	J		
4370374						
AVOVA						
0						
Source of Variation	<i>\$</i> \$	đf	MS	F	P-value	F crit
		1	0.048339104	2.08045492	0.165478422	4.38075176
Between Groups	0.048339104	19	0.048339104	<b>6.000737736</b>	3	,
Within Groups	0.441462567	IA	U.UZ3Z346/Z			
		00				
Total	0.48980167	20				····

```
Simpson's Diversity
    Mixzone
                   Lake
      0.146
                   0.166
     0.113
                   0.195
     0.208
                   0.187
     0.166
                   0.188
     0.199
                   0.182
     0.186
                    0.19
     0.238
                   0.256
     0.224
                   0.145
                   0.169
                   0.273
                   0.187
                   0.161
                   0.161
                   0.224
Phytoplankton - Simpson's Diversity (Log10 Transformation)
    Mixzone
                   Lake
  -0.835647144
                -0.7798919
  -0.946921557
                -0.7099654
  -0.681936665
                -0.7281584
  -0.779891912 -0.7258422
 -0.701146924
               -0.7399286
 -0.730487056 -0.7212464
 -0.623423043
                 -0.59176
 -0.649751982
                 -0.838632
                -0.7721133
                -0.5638374
                -0.7281584
                -0.7931741
                -0.7931741
                 -0.649752
               Phytoplankton - Simpson's Diversity
Anova: Single-Factor
Summary
    Groups
                  Count
                               Sum
                                          Average
                                                     Variance
Mixzone
                    8.
                            -5.9492063 -0.7436508
                                                     0.0114508
Lake
                    14
                            -10.135634 -0.7239739
                                                     0.005946
ANOVA
Source of Variation
                                            MS
                                                                  P-value
                                                                                  F crit
Between Groups 0.0019711
                                         0.0019711
                                                    0.2503722
                                                                0.622274523
                                                                               4.351250027
Within Groups
               0.15745385
                                20
                                        0.00787269
Total
               0.15942495
                                21
```

Richnes	5					
Mirzone	Lake					
36	26					
36	25					
34	27					
35	30					
34	32					
35	27		•			
33	31					
35	29					
33	31					
	30					
	26					
	26					
	26					
	24					
				,	•	
	Phytoplankt	on - Di	chness			
nova: Single-Fact		оц <b>- к</b> о	ICHTIC33			•
move. Dange v au	<b>.</b>					
ummary						
, ———,						
Groups	Count	Sum	Average	Varianc <b>e</b>		
lixzone	8	278	34.75	1.07142857		
ake	14	390	27.8571429	6.59340659		
AVONA						
Source of Variation	00	36	MS	F	P-value	F crit
	<u>SS</u>	df	241.876623	51.8969	5.6579E-07	4.35125002
Setween Groups	241.876623	1		31.6909	3.03/36-0/	4.33123002
Vithin Groups	93.2142857	20	4.66071429			
`otal	335.090909	21				
OLZI	333.090707					
					•	
					•	
					•	
-						
-						
-						

Evenn						
Mixzone		•	•			
	Lake					
0.661	0.583					
0.748	0.602					
0.531	0.567					
0.71	0.65					
0.58	0.633					
0.599	0.644					
0.56	0.558					
0.563	0.704					
1	0.635			•		
	0.483					
	0.657					
ľ	0.669					
	0.615					
	0.671					
	Phytoplank	ton - Eve	nness			
Anova: Single-Fact	tor					
<u> </u> _						
Summary			•	•		
_	_	_				
Groups	Count	Sum	Average	Variance	_	•
	_			••	•	
Mixzone	8	4.952	0.619	0.00613829		
Lake	14	8.671	0.61935714	0.00326394		
İ			,			
ANOVA				•		
_					•	
Source of Variation						
	22	df	MS	F	P-value	F crit
Between Groups	6.4935E-07	1	6.4935E-07	0.00015207	0.99028305	4.35125003
Within Groups	0.08539921	20	0.00426996			
,						
Total	0.08539986	21				
•			·			
	·					

Shannon-Weine	r Diversity					
Mixzone	Lake					
2.281	2.261					
2.441	2.058					
2.099	2.158					
2.082	2.029					
2.068	2.088					
2.114	2.028					
1.901	1.822					•
1.962	2.234					
1,700	2.162					
	1.869					
	2.026			•		
	2.17	•				
	2.245					
	1.815					
	2.2.2					
Phytor	lankton - Shai	nnon-We	iner Diversit	·v		
Phytop Anova: Single-Fac		ппоп- 44 с	inci Diversit	· <b>J</b>		
-					,	
Summary						
Groups	Count	Sum	Average	Variance .	•	
divzone.	£	16 948	2 1185	0.02949914		
	8 1 <i>4</i>	16.948 28.965	2.1185 2.0689286	0.02949914 0.02253638		
Mixzone Lake	8 14	16.948 28.965		0.02949914 0.02253638		
Lake	_					
Lake	_					
	14	28.965	2.0689286	0.02253638	P velve	E avit
Lake ANOVA Source of Variation	14 n SS	28.965 df	2.0689286 <i>M</i> S	0.02253638 F	P-value	F crit
ake ANOVA Source of Variation Between Groups	14 2SS 0.01251003	28.965	2.0689286 MS 0.01251	0.02253638	P-value 0.48725635	
ake ANOVA Source of Variation Between Groups	14 n SS	28.965 df	2.0689286 <i>M</i> S	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965	2.0689286 MS 0.01251	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups	14 2SS 0.01251003	28.965	2.0689286 MS 0.01251	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ANOVA Source of Variation Between Groups Within Groups	14 SS 0.01251003 0.49946693	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups Fotal	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups Fotal	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups Fotal	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups Fotal	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups Fotal	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ake ANOVA Source of Variation Between Groups Within Groups Fotal	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
ANOVA Source of Variation Between Groups Within Groups	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
Lake ANOVA Source of Variation Between Groups Within Groups	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		
Lake ANOVA Source of Variation Between Groups Within Groups	14 2 SS 0.01251003 0.49946693 0.51197695	28.965  df 1 20 21	2.0689286  MS 0.01251 0.0249733	0.02253638 F		

	% Richness					
Mizzone	Lake			*		
54.39	47.95				•	
63.78	48.94					
48	45,53					
53.47	54.29					
46,47	53.8					
43.58	44.71					
44.65	36.35					
44.44	46.7					
77,77	45.74					
	40.5	•				
	54.14 :					
	54.14 54.75					
	34.73 47.2					
	47.2 47.23					
	47.23					
	Phytoplankt	on - % R	ichness			
Anova: Single-Fac	ctor					
_						
Summary						
Groups	Count	Sum	Average	Variance		
<u> </u>	COMM	Dum.	Average	rance	•	
Mixzone	8	398.78	49.8475	48.3183929		
Lake	14	667.83				
			**********	20.0722407		
ANOVA						
Source of Variation		-				
	22	đſ	MS	F	P-value	F crit
Between Groups	<u>SS</u> 23.4312006	1	23.4312006			F crit 4.351250027
Between Groups	22					
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006			
Between Groups Within Groups	<u>SS</u> 23.4312006	1	23.4312006			
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006			
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006			
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006			
Between Groups	23.4312006 711.266986	1 20	23.4312006			
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006			
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581		
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006	0.6588581		
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581		
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581		
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581		
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581	0.42651892	
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581	0.42651892	
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581	0.42651892	
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581	0.42651892	
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581	0.42651892	
Between Groups Within Groups	23.4312006 711.266986	1 20	23.4312006 35.5633493	0.6588581	0.42651892	

Hill's N	1					
Mixzone	Lake				-	
	9.59					
9.79	7.83					
11.48						
8.16	8.65					
8.02	7.6					
7.9	8.07					
8.28	7.6					
6.698	6.18					
7.11	9.34					
	8.69	*				
	6.48					
•	7.58					
•	8.76					
	9.44					
	6.14					
Anova: Single-Fact	Phytoplank or	ton - Hill	's N1			
Summary						
Groups	Count	Sum	Average	Variance		
Mixzone	8	67.438	8.42975	2.34838907	•	
Lake	14	111.95	7.99642857	1.34507088		
ANOVA		•				
Source of Variation	L			_		<b>.</b>
	SS	df	MS	F	P-value	F crit
Between Groups	0.95590707	1		0.56354728	0.46157617	4.35125002
Within Groups	33.9246449	20	1.69623225			
Total	34.880552	21			<u>·                                      </u>	.,
Total	34.880552	21				
Total						<u> </u>
Total		21			·	
Total						
Total						
Total						
Total						
Total						
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Total						
Total						
Total						
Total						
Total						
Total						

# Amoco Cove Zooplankton

Richnes	:S					· · · · · · · · · · · · · · · · · · ·
Mizzone	Lake					
12	11 .					
13	12					
11	. 11					
11	13					
10	13					
10 .	15					
	•					
	Zooplankto	n - Ric	hness			
Anova: Single-Fact				•		
						•
Summary						
					•	
Groups	Count	Sum	Average	Variance		•
Mixzone	6	67	11.1666667	1.36666667		
Lake	6	75	12.5	2.3		-
Lake	J	,,,	12.5	<b>4.3</b>		*
ANOVA				•		•
Source of Variation				_		
	22	df	MS	F	P-value	F crit
Between Groups	5.33333333	1	5.33333333	2.90909091	0.11889393	4.96459052
Within Groups	18.3333333	10	1.83333333			
Total	23.6666667	11				

Danaita	<del></del>	······································				
Density Mixzone	Lake					i
3.11	3.53			*		1
2.66	2.16					l
1.76	3.96					
3.62	2.04					`
2.2	2.94					I
2.43	3.97					
2.11	2.61					
2.8	2.77					
	1.69					
	2.05					
	2.97					
	2.32					
	2.32 2.44					
•	6.44					
						1
Phytoplankton - De	neity (Log10 T	rangformatic	nn)			
Mixzone	Lake	. allivi liatit	·~ ;			Ī
	0.54777471					
0.492760389						
0.424881637	0.33445375			•		
0.245512668	0.59769519					
0.558708571	0.30963017				· · •	
0.342422681	0.46834733					
0.385606274	0.59879051					
0.324282455	0.41664051					
0.447158031	0.44247977					
	0.2278867					
	0.31175386					
1	0,47275645					
	0.36548798					
	0.38738983		_			
1	0.80888587		•			
	0.00000707					
,						
Phytoplankton - De	nsity	<del></del>				
Anova: Single-Facto	•					
Summary						
	_	_	4	**************************************		
Groups	Count	Sum	Average	Variance	ı	
Mixzone	8	3 77122771	0.40266659	0 00995726		
4						
Lake	14	6.28997262	0.447203/0	U.UZZ6376		
ANOVA						
MINOVA						
Source of Variation						
DOMICE OF ASSISTION	SS	df	MS	F	P-value	F crit
Data Comme		1			0.44630797	
Between Groups	0.01106336			U.UUJJ/6/4	V.77UJU171	7.33123003
Within Groups	0.3665922	20	0.01832961			
Total	0.37765556	21				•

Shannon-Weir						
Mixzone	Lake					
0.762	0.572					•
0.588	0.479					
0.82	0.527					
0.497	0.878					
0.261	0.915					
0.146	1.06					
Zooj	olankton - Shan	non-We	iner Diversit	<u> </u>	·	
Zoon Anova: Single-Fa	plankton - Shan	non-We	iner Diversit	y ·		***************************************
Zooj Anova: Single-Fa Summary	plankton - Shan ctor	nnon-We	iner Diversit	y .		· ·
Anova: Single-Fa	plankton - Shan octor Count	nnon-We	iner Diversit Average	y Variance		·
Anova: Single-Fa Summary  Groups	ctor			Variance	•	·
Anova: Single-Fa Summary  Groups  Mixzone	Count	Sum	Average	Variance	•	·
Anova: Single-Fa Summary	Count 6	Sum 3.074	Average 0.5123333	Variance 0.07206427		·
Anova: Single-Fa Summary  Groups  Mixzone Lake	Count 6 6	Sum 3.074	Average 0.5123333	Variance 0.07206427	•	
Anova: Single-Fa Summary  Groups  Mixzone Lake  ANOVA	Count 6 6	Sum 3.074	Average 0.5123333	Variance 0.07206427	P-value	F crit
Anova: Single-Fa Summary  Groups  Mixzone Lake  ANOVA  Source of Variation	Count 6 6	Sum 3.074 4.431	Average 0.5123333 0.7385	Variance 0.07206427 0.0587539		
Anova: Single-Fa Summary  Groups  Mixzone Lake  ANOVA	Count  6 6 6	Sum 3.074 4.431	Average 0.5123333 0.7385	Variance 0.07206427 0.0587539	P-value 0.15660117	

Simpson's Di	versity					
Mizzone	Lake					
0.699	0.777					
0.746	0.821					
0.64	0.797					
0.81	0.462					
0.9	0.459			,		
0.955	0.426					
·						
*						
	Zooplankton - S	impson's I	Diversity			
Anova: Single-Fact		p				
. M.O.M	-					
Summary						
· .		_	_ a.			
Groups	Count	Sum	Average	Variance		
Mixzone	6	4.75	0.79166667	0.0144851		
Lake	6	3.742	0.62366667	0.0369639		
Lake	· ·	3,742	0.02300001	0.0505055		
ANOVA	•					
Source of Variation					•	
	SS	àf	MS	F	P-value	F crit
Between Groups	0.084672	1	0.084672	3.2914968	0.099708798	4.96459051
Within Groups	0.25724467	10	0.02572447			

0.34191667

Hill's N						
Mixzone	Lake					
2.1	1.7					
1.8	1.6					
2.3 1.6	1.7					
1.3	2.4 2.4					
1.1	2.4					
1.1	. 2.0					
				•		
				•		
	Zoonlank	ton - Hill'	e N1	······································		
Anova: Single-Facto						•
Summary						•
Groups	Count	Sum	Average	Variance	•	
Mixzone	6	10.2	1.7	0.212		
Lake	6 .	12.6	2.1	0.248		
	•	10.0		<b></b>		
ANOVA						
Source of Variation				•		
	22	df	MS	F	P-value	F crit
Between Groups	0.48	1	· 0.48	2.08695652		4.964590516
Within Groups	2.3	10	0.23			
.•						
Total .	2.78	11				

Evenness						
Mizzone	Lake					
0.376	0.369					
0.423	0.353		•			
0.417	0.365			÷		
0.361	0.826					
0.353	0.785					
0.296	0.71					
•		•				
	Zooplankt	on Francisco	200			
Anova: Single-Facto		OH - FACT	TIC22			
Allova. Single-Pacto	•					
Summary						
Ju,						
Groups	Count	Sum	Average	Variance	, *·•s	
		0.006	0 221	0.0021788		
Mixzone	6	2.226	0.371 0.568	0.0021788		
Lake	6	3.408	0.368	0.0321704		
ANOVA		•				
Source of Variation						
Source of Astismon	SS	25	MS	F	P-value	F crit
		df		4,28440529		4.96459052
Between Groups	0.116427	1	0.116427	4.28440329	U.U0327083	4.70437032
Within Groups	0.271746	10	0.0271746			•
Total	0.388173	11				
Total	0.3001/3	11				

		ri(	oat Periph	yton		
Richne						
Mixzone	Lake				•	
21	22				<b>v</b>	
22	22					
23	22					
24	27					
17	26					
18	27					
	26					
						-
				•		
	Float Periphy	ton - I	Richness			
Anova: Single-Fac	tor					
,	• •					
Summary	•					
						•
Groups	Count	Sum	Average	<b>Variance</b>		
					•	
Mixzone	6	125	20.8333333	7.76666667		
Lake	7	172		5.95238095		
ANOVA						
Source of Variation	<b>L</b>					
	22	df	MS	F	P-value	F crit
Between Groups	45.1446886	1	45.1446886	6.66140088	0.02554615	4.8443382
Within Groups	74.547619		6.77705628			
····			0.77.700020			
Total	119.692308	12				
10(2)	119.092308	12				
			•			
			•			
	-					
•						

Density	· · · · · · · · · · · · · · · · · · ·					
Mixzone	Lake					
11.46	10.66					
20.78	10.28					
12.89	17.98					
10.11	27.73					
33.33	13.65					
42,77	12.72					
1		•				
1						.
	7					
Anova: Single-Facto	Zoopiank or	iton - Densi	.ty			
Summary						
Groups	Count	Sum	Average	Variance	•	
Mixzone	6	131.34	21.89	179.32668		
Lake	6	93.02	15.5033333	43.5096267		
	•	73.02	10,000000	43.3070207		ļ
ANOVA						
Source of Variation						
500000 01 101000	<b>SS</b>	df	MS	F	P-value	F crit
Between Groups	122.368533	1	122.368533	1.09828183	0.31931204	4.96459052
	122.300333	_	144.300333	1.07040103	0.31331704	4.70437032
Within Groups	1114.18153	10	111.418153			

Total

1236.55007

11

		2.0	at r cribn	,		
Shannon-Wein	er Diversity					
Mizzone	Lake					
1.49	1.69					
1.75	1.51					
1.7	1.64					
2	1.63					
1.48	1.49			1		
1.47	1.69					
	1.68					
•						ı
				•	····	
	eriphyton - Sha	innon-W	einer Divers	ity		
Anova: Single-Fa	ctor					
Summary						
•						
Groups	Count	Sum	Average	Variance		
Groups			2274.484		•	
3 C	.6	9.89	1 6402222	0.04437667		
			10483333	U.U443/00/		
Mixzone						
Mixzone Lake	7	11.33	1.6185714			
Lake						
Lake ANOVA	7					
Lake	7		1.6185714	0.00714762		·
Lake ANOVA	7	11.33			P-value	F crit
Lake ANOVA Source of Variatio	n SS	11.33 df	1.6185714 <i>MS</i>	0.00714762 F		
Lake ANOVA Source of Variatio Between Groups	7 n SS 0.00286172	11.33 <i>df</i> 1	1.6185714 MS 0.0028617	0.00714762 F		
Lake ANOVA Source of Variatio	n SS	11.33 df	1.6185714 <i>MS</i>	0.00714762 F		
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33 <i>df</i> 1 11	1.6185714 MS 0.0028617	0.00714762 F		
Lake ANOVA Source of Variatio Between Groups	7 n SS 0.00286172	11.33 <i>df</i> 1	1.6185714 MS 0.0028617	0.00714762 F		
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33 <i>df</i> 1 11	1.6185714 MS 0.0028617	0.00714762 F		
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33 <i>df</i> 1 11	1.6185714 MS 0.0028617	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33 <i>df</i> 1 11	1.6185714 MS 0.0028617	0.00714762 F		4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33 <i>df</i> 1 11	1.6185714 MS 0.0028617	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 on SS 0.00286172 0.26476905	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 25 0.00286172 0.26476905 0.26763077	11.33  df 1 11 12	1.6185714 MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 25 0.00286172 0.26476905 0.26763077	11.33  df 1 11 12	MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264
Lake ANOVA Source of Variatio Between Groups Within Groups	7 25 0.00286172 0.26476905 0.26763077	11.33  df 1 11 12	MS 0.0028617 0.0240699	0.00714762 F	0.73674176	4.844338264

Simpson's D			
Mixzone	Lake		
0.22	0.17		
0.15	0.19		
0.15	0.17		
0.11	0.17		
0.22	0.19		
0.2	0.15		
	0.15		
	0.15		

Mizzone	Lake			
-0.657577319	-0.7695511			
-0.823908741	-0.7212464	•		
-0.823908741	-0.7695511			
-0.958607315	-0.7695511 °			
-0.657577319	-0.7212464			
-0.698970004	-0.8239087			
	-0.8239087		•	

Float Periphyton - Simpson's Diversity Anova: Single-Factor

Summary

Groups	Count	Sum	Average	Variance		
					•	
Mixzone -	6	-4.6205494	-0.7700916	0.0143416		
Lake	7	-5.3989635	-0.7712805	0.0017592		
ANOVA						
Source of Variation						
	22	đf	MS	F	P-value	F crit
Between Groups	4.5669E-06	1	4.5669E-06	0.0006107	0.980727529	4.844338264
Within Groups	0.08226321	11	0.00747847			
Total	0.08226778	12				

Hill's	1	
Mizzone	Lake	
4.4	5.4	
5.7	5.3	
5.4	5.1	
7.4	5.1	·
4.4	4.8	
4.3	5.4	
	5.3	
•		
	· •	
	-	

Float Periphyton - Hill's N1

Anova: Single-Factor

#### Summary

Groups	Count	Sum	Average	Variance
Mixzone	6	31.6	5.26666667	1.43866667
Lake	7	36.4	5.2	0.04666667

#### ANOVA

#### Source of Variation

		đſ	MS	F	P-value	F crit
Between Groups	0.01435897	1	0.01435897	0.02113498	0.88704155	4.844338264
Within Groups	7.47333333	. 11	0.67939394			
Total	7.48769231	12				

Evenne	ess			
Mixzone	Lake			
1.03	1.11			
1.17	1.22			
1.24	1.19			
1.2	1.19			
1.03	1.21			
1.18	1.24			
	1.22			

Float Periphyton - Evenness (Log10 Transformation)
Mizzone Lake

Float Periphyton - Evenness

Anova: Single-Factor

Summary

Groups	Count	Sum	Average	Variance		
Mixzone	6	0.33835	0.05639087	0.00121272		
Lake	7	0.54534	0.07790623	0.00024671		
ANOVA						
Source of Variation						
	22	đſ	MS	F	P-value	F crit
Between Groups	0.00149556	1	0.00149556	2.18072448	0.16779534	4.84433826
Within Groups	0.00754388	11	0.00068581			
Total	0.00903944	12				

		2110	re Peripi	путоп		
Richness						
Mixzone	Lake			•		
6 8	5 6					
8 6	6					
· 10	5					
10	3					
St Anova: Single-Factor	ore Perip	nyton - F	ucnness			
THOVE. SHIGHT-FACTOR	<b>L</b>					
Summary						
J						
Groups	Count	Sum	Average	Variance	.•	
			317C/Uge	r di tarree	•	•
Mixzone	4	30	7.5	3.66666667		
Lake	4	22	5.5	0.33333333		
ANOVA						
Source of Variation						
	SS	df	MS	F	P-value	F crit
Between Groups	8	1	. 8	4	0.09242631	5.9873741
Within Groups	12	6	• 2			
otal	20	7				
	1					
				-		
-			•			
•						

Density						
Mizzone	Lake					
7.47	8.97					
8.09	5.16			•		
5.57	6.4					
3.86	5.22					
8.13	4.94					
6.3	7.1					
•	8.13					•
•					-	
					:	
,						
·					:	
	Float Peripl	hyton - Der	nsity		: .	,
Anova: Single-Facto		hyton - Dei	nsity		: .	
Anova: Single-Facto Summary  Groups		hyton - Dei Sum	nsity Average	Variance	:	
Summary Groups	Count	Sum	Average		: .	
Summary  Groups  Mixzone	Count 6	Sum	Average	2.7942	:	
Summary Groups	Count	Sum	Average		: .	
Summary  Groups  Mixzone	Count 6	Sum	Average	2.7942		
Summary  Groups  Mixzone Lake  ANOVA	Count 6	Sum	Average	2.7942		
Summary  Groups  Mixzone  Lake	Count 6	Sum	Average 6.57 6.56	2.7942 2.49503333	P-value	F crit
Summary  Groups  Mixzone Lake  ANOVA  Source of Variation	Count  6 7	Sum 39.42 45.92	Average 6.57 6.56	2.7942 2.49503333	P-value 0.991357	
Summary  Groups  Mixzone Lake  ANOVA  Source of Variation  Between Groups	Count 6 7	Sum 39.42 45.92	Average 6.57 6.56	2.7942 2.49503333		
Summary  Groups  Mixzone Lake  ANOVA  Source of Variation	Count  6 7  SS 0.00032308	Sum 39.42 45.92  df 1	Average 6.57 6.56  MS 0.00032308	2.7942 2.49503333		F crit 4.84433826

Mixzone	Talia			
	Lake			
0.16	0.18			
0.09	0.21			
0.14	0.16			
0.11	0.19	•		

Shore Periphyton - Simpson's Diversity (Log10 Transformation)

Mizzone	Lake
-0.795880017	-0.7447275
-1.045757491	-0.6777807
-0.853871964	-0.79588
-0.958607315	-0.7212464

Shore Periphyton - Simpson's Diversity Anova: Single-Factor

Summary

Groups	Count	Sum	Average	Variance		
Mixzone	4	-3.6541168	-0.9135292	0.0123056		
Lake	4	-2.9396346	-0.7349087	0.0024214		
ANOVA						
Source of Variation						
	22	df	MS	F	P-value	· F crit
Between Groups	0.0638106	1	0.0638106	8.6658265	0.025820665	5.987374152
Within Groups	0.04418085	6	0.00736347			•
Total	0.10799145	7				

		ЭЦО	ie reithn	iytun		
Shannon-Weiner	Diversity					
Mixzone	Lake					
1.69	1.43					
1.97	1.65					
1.71	1.56					
2.19	1.52					
			•			
				•	<del></del>	
		12nnon-W	Veiner Diver	sity		
Anova: Single-Facto	T.					
Summary						
Groups	Count	. Sum	Average	Variance	•	
Mixzone	4	7.56	1.89	0.05626667		
Lake	4	6.16	1.54	0.00833333		•
	•			• • • • • • • • • • • • • • • • • • • •		
ANOVA						
Source of Variation	•					
		`26	MS	F	P-value	F aut
	22	aj	MS	r	1 -yaine	r crit
Retween Groups	.SS 0.245	df 1				F crit 5.987374152
Between Groups Within Groups	0.245 0.1938	1 6	0.245 0.0323	7.58513932	0.03311094	5.987374152

Total

0.4388

7

		ЭПО	ге Регірпу	TOIL		
Hill's Ni						
Mixzone	Lake					
5.44 7.2	4.21 5.21					
5.53	4.76					
8.12	4.53			•		
			•			
				-		
	Shore Perip	hyton - H	ill's N1			•
Anova: Single-Facto	r	•				
Summary						
suitinary ,			•			
Groups	Count	Sum	Average	Variance		
					•	
Aixzone .	4	26.29	6.5725	1.71929167		
ake	4	18.71	4.6775	0.17689167		
ANOVA						
Source of Variation						
Joure of Variation	SS	af	MS	F	P-value	F crit
Between Groups	7.18205	1	7.18205		0.03318959	
Within Groups	5.68855	6	0.94809167	7.57526762	0.03310337	5.70131420
······································	5.5555	•	0.51005107			
Total .	12.8706	7			•	
	_					
	-					
-						
		•				

Evenness					•	
Mizzone	Lake					
1.21	1.2					
1.48	1.26					-
1.31	1.12					
1.19	1.27					
				•		
	Shore Periph	iyton - Ev	enness'			
Anova: Single-Facto		byton - Ev	'enness			
Anova: Single-Facto		byton - Ev	enness.			
		hyton - Ev	'enness			
Anova: Single-Facto		byton - Ev Sum	enness  Average	Varianc <b>e</b>		
Anova: Single-Facto Summary	or ·	Sum 5.19	Average 1.2975	0.01755833		
Anova: Single-Facto Summary  Groups	Count	Sum	Average			
Anova: Single-Facto Summary  Groups  Mixzone	Count	Sum 5.19	Average 1.2975	0.01755833		
Anova: Single-Factor Summary Groups Mixzone Lake	Count	Sum 5.19	Average 1.2975	0.01755833		
Anova: Single-Factor Summary  Groups  Mixzone Lake  ANOVA	Count	Sum 5.19	Average 1.2975	0.01755833	P-value	F crit
Anova: Single-Factor Summary  Groups  Mixzone Lake  ANOVA  Source of Variation	Count 4 4	Sum 5.19 4.85	Average 1.2975 1.2125	0.01755833 0.00475833	<i>P-value</i> 0.29852064	
Anova: Single-Factor Summary  Groups  Mixzone Lake  ANOVA	Count  4 4 4	Sum 5.19 4.85	Average 1.2975 1.2125	0.01755833 0.00475833		

#### EPISAM.XLS

Amoco Epis	ammon								
Rich	ness	Shanno	n-Weiner	Simpson's	Diversity	Hil	  'a N1		
Mixzone	Lake	Mixzone	Lake	Mixzone	Lake	Mixzone	Lake		<del> </del>
16	19	2,444	2.525		0.084	10.993	12.494		<del> </del>
17	13	2.397	2.228						
t-Test: Tw	o-Sample A	suming Equ	al Variances			t-Test: Tw	o-Sample		
Richness			Mixzone	Leke		Shannon		Mizzone	Lake
Mean			16.5	16		Mean		2.4205	2.3765
Verience			0.5	18		Variance		0.001105	0.044104
Observation	18		2	2		Observation	ns	2	2
Pooled Vari	ence		9.25			Pooled Vari	ance	0.022605	
Hypothesize	ed Mean Dif	ference	0			Hypothesize	ed Mean Difference	0	
df		·	2			df		2	
t			0.164399	ne		t		0.292655	ne
P(T < = 1) or	ne-tail		0.442265			P(T < = t) o	ne-tail	0.398678	
t Critical on			2.919987			t Critical on	e-tail	2.919987	
P(T < = t) tv	vo-tail		0.88453			P(T < = t) tv	vo-tail	0.797355	
t Critical tw	o-tail		4.302656			t Critical tw	ro-tail	4.302656	
t-Test: Two	o-Sample As	sumina Eau	al Variances			t-Test: Tw	o-Sample		
Hara N1			Mizzone	Lake	· · · · · · · · · · · · · · · · · · ·	Simpson's Div		Mixzone	Lake
Mean			11.2545	10.8895		Mean		0.1145	
Verience			0.136765	5.148841		Variance			0.000733
Observation	18		2	2		Observation	18	2	2
Pooled Varie	BNCO		2.642803			Pooled Vari	ance	0.000409	
Hypothesize	d Mean Diff	erence	0			Hypothesize	ed Mean Difference	0	
df			2			df		2	
t			0.224523	กร		t		0.56124	ns
P(T < = t) or	ne-tail		0.421601			P(T < = t) or	ne-tail	0.315565	
t Critical on	e-teil		2.919987			t Critical on	e-teil	2.919987	
P(T < = t) tw	vo-tail		0.843202			P(T < = t) tv	vo-tail	0.631129	
t Critical tw	o-tail		4.302656			t Critical tw	o-tail	4.302656	

# **BRAY-CURTIS**

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